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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/651,783

08/30/2000

Shuichi Kanno

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EXAMINER

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 09/651,783	Applicant(s) KANNO ET AL.	
	Examiner Ngoc-Yen M. Nguyen	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 June 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3,4,11-14,16 and 17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3,4,11-14,16 and 17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 1, 2009 has been entered.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3-4, 11-14, 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 3, 4, 11, 13, there is no antecedent basis for "a mist containing *said* at least part of decomposition products".

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-4, 11-14, 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0 885 648 in view of JP 11-216,455, Lang et al (6,235,256), Bowker (4,687,543) and optionally further in view Geisler et al (4,465,655).

EP '648 discloses a process for decomposing fluorine compounds, comprising the steps of contacting a gas flow containing the fluorine compounds, which comprises fluorine as a halogen element, and any of the elements carbon, nitrogen and sulfur as a compound with the fluorine, with a fluorine compound-decomposition catalyst in the presence of steam to hydrolyze the fluorine compound in said gas flow, wherein said gas flow containing said fluorine compounds is contacted with a catalyst comprising Al to convert said fluorine compounds to hydrogen fluoride (note claim 1). In the equation 4 and 5 on page 3 of EP '648, when SF_6 or NF_3 is being decomposed, SO_3 or NO is formed. In the embodiments 6 and 7, SF_6 or NF_3 is diluted with air or nitrogen, the resulting gas is contacted with a catalyst to decompose the fluorine compound. The decomposed gas is scrubbed in an alkaline scrubber (note page 10, lines 1-25).

EP '648 discloses that sulfur oxides such as SO_2 , SO_3 and the like, and nitrogen oxides, such as NO , NO_2 , and the like, are generated in some cases. In order to neutralize and eliminate these products, a method of scrubbing the decomposed gas by spraying an aqueous alkaline solution is desirable (note paragraph bridging pages 3-4). Thus, the scrubbing step is considered as the step of removing SO_x and NO_x from the washed gas.

The differences are EP '648 does not disclose (1) the step of decomposing a toxic component containing SO_2Cl_2 and (2) the step of removing SO_x or NO_x from the

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decomposed gas after scrubbing by passing the gas after the scrubbing step through a cyclone or demister.

For (1), the halogen compounds to be decomposed in EP '648, such as CF_4 , C_2F_6 , etc. are compounds that are used as a semiconductor etching agent. EP '648 does not disclose the presence of a toxic component containing SO_2Cl_2 .

Bowker '543 discloses a method for selectively etching an insulating layer overlying a body of material including silicon comprising the steps of: subjecting said layer to a plasma discharge in a gas mixture containing sulfur hexafluoride as a non-carbon containing source of volatile fluorine ions, and a fluorocarbon (note claim 1 and column 2, lines 42-48). Bowker '543 further discloses that while from the broad standpoint any non-carbon containing source of volatile fluorine or chlorine ions can be used in the plasma, only certain fluorides are useful as a practical matter in view of corrosion and toxicity problems, etc. Other fluorides which can be a source in such a plasma of volatile fluorine atoms are nitrogen fluoride, boron fluoride, sulfuryl fluoride (note column 3, lines 4-14). Thus, Bowker '543 fairly suggests in the semiconductor industry, it is advantageous to use an etchant that comprises a non-carbon containing source of volatile fluorine ions, such as sulfuryl fluoride, and a fluorocarbon and the exhaust gas resulting from the process of using such etchant would contain both fluorine containing compound.

For the second "decomposing" step, EP '648 discloses that the stream to be treated can contain more than one fluorine compound and the catalyst can contain at least one element selected from the group consisting of Zn, Ni, Ti, Fe, Sn, Pt, Co, Zr,

Ce, and Si in addition to Al (note page 3, lines 8-15). Thus, when more than 1 element was used in addition to Al, the first element with Al is considered as the claimed “decomposition catalyst” and the second element with Al is considered as the claimed “toxic component decomposition catalyst”.

Optionally, Geisler '655 can be applied to teach a process for the removal of sulfuryl fluoride from exhaust gases by reacting sulfuryl fluoride in the exhaust gases with a dilute aqueous alkali metal hydroxide or alkali metal carbonate solution on an active carbon catalyst (note claim 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an etchant containing sulfuryl fluoride in addition to the fluorocarbon disclosed in EP '648, as suggested by Bowker '543 because the presence of sulfuryl fluoride proves desired selectively in plasma etching without undesired polymer coating of the plasma chamber. It would also have been obvious to one skilled in the art to further remove the sulfuryl fluoride from the exhaust gas by adding an additional catalyst member to the catalyst disclosed in EP '648 or by the process suggested by Geisler '655 because sulfuryl fluoride is a toxic compound that needed to be removed before the exhaust gas can be released into the atmosphere.

For the order to removing the fluorine-containing compounds, i.e. sulfuryl fluoride and fluorocarbon compounds, it would have been obvious to one skilled in the art to carry out the steps of removing the fluorine-containing compounds in any order as long as they are effectively removed. *Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959) (Prior art reference disclosing a process of making a laminated sheet wherein a base sheet is

first coated with a metallic film and thereafter impregnated with a thermosetting material was held to render prima facie obvious claims directed to a process of making a laminated sheet by reversing the order of the prior art process steps.). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) (selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results); *In re Gibson*, 39 F.2d 975, 5 USPQ 230 (CCPA 1930) (Selection of any order of mixing ingredients is prima facie obvious.).

For (2) JP '455 discloses a process for treating an exhaust gas generated in a process of making printed circuit board by passing the exhaust gas through a catalytic thermal decomposition device 4 and the waste gas cleaning device 5 and discharged as a harmless exhaust gas 6 (note English abstract). As shown in Figure 3, the exhaust gas after scrubber 5 is introduced into a cyclone 8. Here the moisture within the exhaust gas is removed and recycled back to the scrubber 5 thereby minimizes the requirement of fresh scrubbing liquid. JP '455 further teaches that a demister can be used instead of a cyclone (note paragraph 0036).

For the limitation of “ the removed mist is then drained through a liquid waste outlet... in the emission said of said gas exhausted in said exhausting step”, since JP '455 desires to recycle the moisture back to be used as scrubbing liquid, it would have been obvious to one skilled in the art to recover such moisture in the form of a liquid and it would also have been obvious to one skilled in the art to repeat the moisture removing step and to select proper equipment to effectively recover and recycle as much as possible of the moisture in the exhaust gas. It would have been obvious to one skilled

in the art to provide a storage tank or a buffer tank to store the recovered moisture in order to accumulate enough moisture for the recycling step or to compensate for the fluctuation in the amount of moisture recovered.

For the instant claim 16, it would have been obvious to one of skill in the art to optimize the inlet velocity to effectively remove the moisture from the exhaust gas and to select an appropriate material for the construction of the cyclone to withstand the condition of the process.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to pass the exhaust gas after the scrubbing step in EP '648 to a cyclone or demister, as suggested by JP '455, because by doing so, the moisture can be removed from the gas and recycled to the scrubber thereby minimizes the requirement of fresh scrubbing liquid. Such step would inherently remove any remaining NO_x or SO_x from the washed gas.

Lang '256 is further applied to disclose a process for scrubbing acid gases, in which, the improvement is a demister arranged at a location after the liquid droplets have been sprayed by the spray means into the flow path of the flue gases (note column 3, lines 8-43 and claim 1). The demister can be a two-level demister, i.e. two demisters (note column 2, lines 36-38 and claim 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to pass the exhaust gas of EP '648 to a demister, as suggested by Lang '256 in order to obtain the advantages as disclosed in Lang '256 (note, for example, column 1, lines 44-50).

Claims 3-4, 11-14, 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanno et al (PGPub US 2001/0001652) in view either JP 11-216,455, Lang et al (6,235,256), Bowker '543 and optionally further in view of Geisler '655.

Kanno '652 is an US counterpart of EP '648.

Kanno '652 discloses a process as mentioned for EP '648 (note claim 1, Examples 11-12).

The differences are Kanno '652 does not disclose (1) the step of decomposing of a toxic component and (2) the step of removing NO_x or SO_x after the scrubbing steps.

For (1), Bowker '543 and optionally Geisler '655 is/are applied as stated above.

For (2), JP '455 and Lang are applied to teach the step of passing the gas after the scrubbing step to a cyclone or demister.

Claims 3-4, 11-14, 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0 885 648 in view of JP 11-216,455, Lang et al (6,235,256), Shufflebotham et al (6,888,040) and optionally further in view Geisler et al (4,465,655).

EP '648 is applied as stated above.

The differences are EP '648 does not disclose (1) the step of decomposing a toxic component containing SO₂Cl₂ and (2) the step of removing SO_x and NO_x from the decomposed gas after scrubbing step.

For difference (1), Shufflebotham '040 discloses a process for destroying fluorocarbon consisting essentially of gaseous fluorocarbons exhausted from a vacuum processing chamber in which a semiconductor substrate is processed (note claim 1). Shufflebotham '040 fairly teaches that in the presence of oxygen, SF_6 decomposes into SO_2 or SO_2F_2 (note Example 2, the two chemical reactions in column 6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to reasonably expect that at least some SO_2F_2 are formed during the etching step or the step of decomposing the PFC in the process of EP '648, and it would have been obvious to remove the toxic SO_2F_2 from the exhaust gas.

Geisler '655 is applied as stated above to teach the step of removing SO_2F_2 .

For difference 2, JP '455 and Lang '246 are applied as stated in the above rejection.

Applicant's arguments filed June 1, 2009 have been fully considered but they are not persuasive.

In response to applicant's argument that the examiner has combined an excessive number of references, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. See *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon

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hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicants argue the embodiment 1 in Applicants' specification discloses that PFC generates a hazardous component containing SO_2F_2 because of the PCF removing catalyst and the substance SO_3 is not obtainable by contacting only with a PFC decomposing catalyst but is obtainable to an acceptable extent by contacting further with a hazardous component removing catalyst.

This argument is not persuasive because the embodiment 1 (pages 14-16 in Applicants' specification), as mentioned by Applicants, does not disclose any of above alleged features. In embodiment 1, both PFC (i.e. SF_6) decomposition catalyst and hazardous component (i.e. SO_2F_2) catalyst were used, but there is no disclosure that the decomposition of PFC would form SO_2F_2 . As a matter of fact, the decomposition by hydrolysis of SF_6 is disclosed on page 4, only SO_3 and HF are disclosed as decomposition products (note equation 1), there was no SO_2F_2 mentioned. The use of hazardous component catalyst appears to decompose only hazardous component, i.e. SO_2F_2 , not to further decompose the PFC compound.

Applicants argue that the decomposition of SF_6 or NF_3 gases typically includes two steps of processing.

This argument is not persuasive for the same reasons as stated above, especially when decomposing NF_3 since the SO_2F_2 cannot be the decomposition product of NF_3 .

Applicants argue that the inventors have found a new problem that washing with water or alkaline aqueous solution causes a part of HF , SO_x , NO_x in the decomposition product to form a mist accompanied with water and the claimed invention uses a cyclone type apparatus to remove the gas and the mist eluded in the washing process.

JP '455 is applied as stated in the above rejection to provide a motivation to use a cyclone to remove the mist in order for recycling purpose. Even though the motivation provided by JP '455 is different than that of Applicants, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Again, the advantages as discussed by Applicants would inherently be achieved when the cyclone as suggested by JP '455 was used to remove the mist.

Applicants argue that Lang '256 does not describe or suggest any origin-gas of the exhaust gas, the two stages of decomposition catalysts.

Lang '256 is applied to teach the use of a two-level demister after a scrubbing process, not to teach the origin-gas of the exhaust gas nor the two stages of decomposition catalysts.

Applicants argue that Lang discloses a water spraying process that is located in the downstream of the demister 4.

In Lang '256, since the flue gas containing the acidic gases is scrubbed with a scrubbing liquid in countercurrent manner, the demister 4 is considered as being downstream of the water spray, i.e. the flue gas comes into contact with the water spray first before passes through the demister 4. Thus, it would have been obvious to one skilled in the art to position the demister after an exhaust gas has been scrubbed by a scrubbing solution to remove the mist from the scrubbed gas.

Applicants argue that JP '455 neither describes nor implies that the decomposition of P compounds is performed using two stages of decomposition catalysts.

JP '455 is applied to teach the step of using a cyclone to remove mist from the scrubbed exhaust gas, not to teach the two stages of decomposition catalysts. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants argue that JP '455 does not describe or suggest the decomposition products of HF, SO_x and NO_x (in the mist) defined in the claimed invention.

As stated above, by using of the cyclone as suggested by JP '455, the same advantages, such as removal of decomposition products from the mist, would inherently be obtained.

Applicants argue that the purpose of JP '455 is to provide a method of and an apparatus for treatment of an exhausted printed circuit board, wherein the method does not emit any harmful gas while processing for recycling or harmless-rendering.

Regardless of what is/are the harmful gas(es) in the exhaust gas, the processes of EP '648 (the primary reference) and of JP '455 disclose a scrubbing process just as in the claimed process, and JP '455 fairly suggests the step of using a cyclone to recover the mist from the scrubbed gas for the purpose of recycling.

Applicants argue that EP '648 does not disclose the decomposition of PFC compounds using two stages of decomposition catalysts.

Applicants' claims do require two catalysts, but they are not considered as "two stages" for the reasons as stated above.

Applicants argue the EP '648 does not disclose that the decomposition of NF_3 or SF_6 generates SO_2F_2 .

It should be noted that the Applicants' claims do not require such limitation, i.e. the presence of SO_2F_2 is required but SO_2F_2 is not required to be a decomposition product of NF_3 or SF_6 .

Applicants argue that EP '648 provides no description of removal of washing-caused mists after a washing process.

JP '455 is applied as stated above to teach the use of a cyclone to remove mists after a scrubbing, i.e. washing, step.

Applicants argue that EP '648 does not disclose that the washing causes a part of HF , SO_x , NO_x included in said decomposition product to form mist accompanied with

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water and there is no description about the removal of HF, SO_x, NO_x before exhausting into the atmosphere.

As stated in the above rejection, the combined teaching of the applied references, specifically EP '648 and JP '455, has all the positive process steps as required in Applicants' claims, it would inherently cause the a part of HF, SO_x, NO_x included in the mist during the washing step (as disclosed in EP '648) and also it would also inherently removing HF, SO_x, NO_x from the mist during the mist removal step using a cyclone (as disclosed in JP '455).

Applicants argue that the claimed invention is made based on a new problem found in the washing of the gas.

Again, the motivation to combine the applied references does not have to be the same as the reason used in the claimed invention.

The rejection over Kanno '652 is maintained for the same reasons as stated above.

Applicants argue that Geisler '655 does not describe or suggest decomposition SF₆ or NF₃ or use of a two-stage-arranged decomposition catalyst or the use of a cyclone.

Geisler '655 is applied to teach that SO₂F₂ in an exhaust gas can be removed by washing the exhaust gas with an alkaline material in the presence of an active carbon catalyst, not to teach the decomposition or the use of a cyclone.

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Applicants argue that Bowker '543 does not describe or suggest at all decomposition of SF_6 or NF_3 , or use of two-stage arranged decomposition catalyst in the decomposition process or the use of a cyclone.

Bowker '543 is applied to teach that sulfuric fluoride (SO_2F_2) can be used with SF_6 as etching gases, thus, the exhaust gas from such etching step would contain both sulfuryl fluoride and sulfur hexafluoride and it would have been obvious to one skilled in the art to remove both of these compounds from the exhaust gas before releasing it to the atmosphere. Bowker '543 is not relied upon to teach or suggest the decomposition catalysts or the use of a cyclone.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Ngoc-Yen M. Nguyen/
Primary Examiner, Art Unit 1793

nmn
August 20, 2009